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Exhibit A Page 103 of 103

## AFFIDAVIT OF JEFFREY A. KRAUSS

I, Jeffrey A. Krauss, being duly sworn, do depose and state as follows:

- 1. I am a Communications Consultant specializing in Telecommunications and Technology Policy retained by Hye Crest Management, Inc.
- I am familiar with the factual matters presented in Sections 2, 3, 4 and 5 of the foregoing Response of Hye Crest Management, Inc. in File No. 10380-CF-P-88. Except for those factual matters of which official notice may be taken, which are matters of public record, or which are supported by separate affidavit, the factual matters presented in the foregoing Sections are true to my personal knowledge.

10/13/88

Date

Jeffrey N. Krauss

Subscribed and sworn before me this 13th day of October, 1988.

istary Public

My Commission Expires: 6/14/92

## AFFIDAVIT OF THOMAS HAYES

- I, Thomas Hayes, being duly sworn, do depose and state as follows:
  - 1. I am Vice President, Marketing/Development for Hye Crest Management, Inc.
  - 2. I am familiar with the factual matters presented in Section 1 of the foregoing Response of Hye Crest Management, Inc. in File No. 10380-CF-P-88. Except for those factual matters of which official notice may be taken, which are matters of public record, or which are supported by separate affidavit, the factual matters presented in Section 1 are true to my personal knowledge.

10/13/88

Date

Thomas Hayes

Subscribed and sworn before me this 13 day of October, 1988.

Notary Public

My Commission Expires: 5-3/85



### CERTIFICATE OF SERVICE

- I, Jennifer Garcia, a secretary in the law firm of Koteen & Naftalin, do hereby certify that copies of the foregoing "RESPONSE OF HYE CREST MANAGEMENT, INC.," with attachments, were mailed first-class U.S. Mail, this 14th day of October, 1988 to the following:
  - \* Dennis R. Patrick
    Chairman
    Common Carrier Bureau
    Federal Communications Commission
    1919 M Street, N.W
    Room 814
    Washington, D.C. 20554
  - \* James H. Quello
    Commissioner
    Common Carrier Bureau
    Federal Communications Commission
    1919 M Street, N.W
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  - \* Patricia Diaz Dennis
    Chairman
    Common Carrier Bureau
    Federal Communications Commission
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  - \* Gerald Brock, Chief Common Carrier Bureau Federal Communications Commission 1919 M Street, N.W. Room 500 Washington, D.C. 20554
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- \* James R. Keegan, Esq.
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- \* Theodore R. Waddell, Esq. Chief, Domestic Radio Branch Common Carrier Bureau 2025 M Street, N.W. Room 6310 Washington, DC 20554
- \* Mr. Frank Peace, Jr.
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/s/ Jennifer Garcia Jennifer Garcia

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January 25, 1989

Federal Communications Commission
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Commission R. Maddell
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Ro: File No. 10380-CF-P-88
Callsion WLT379

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In Daniel of Mye Crost Management, Inc. (Hye Crest), this is to will not the contain allegations made by National Spectrum Management Association (NSMA) in its Reply pleadings filed November 7, 2008 regarding the above-captioned application. These allegations were made for the first time in the "Reply" round of pleadings, so that Mye Crest has not had the opportunity to comment on them and he present its own analysis of these technical matters. It is magasshed that this letter be associated with the Commission's libes in this presending.

To eve filing concurrently an amendment to the above-referenced and lication containing a technical report prepared by microwave The larmand 3. Sossand and Dr. Joseph F. White. The technical I for in responsive to MSMA's Exhibit A and shows that, with the reasonable angineering practices, the 27.5 - 28.5 GHz band ay be used by point-to-point links located immediately adjacent and within the authorized service area of the Hye Crest pointint chambians in the same band. It also shows that the thick A calculations are based on unrealistic assumptions and to ovarily conservative that they would never realistically consisted to be encountered in normal practice. For example, the adducaptions ignore cross-polarization isolation and the it is mail isolation achieved by an interleaved channel plan. They rowers passon levels for point-to-point links that are far too high The of wime distance are infinite. Most importantly, they ignore will also detectable signal color which Sunther suppression of interference is not

In this admirabed technical report prepared by Bossard and White, it decreases that if reasonable engineering practices are suplayed, barrful co-channel interference cases can be avoided.

The same service area as that to be served by Hye Crest would necessarily cause harmful interference to Hye Crest's operations is vyong. See particularly the analysis of Bossard and White in Case nes. 3 and 4. It should be added that there exists now a substantial body of engineering experience which can be employed to avoid harmful interference in the event any point-to-point system is to be operated in the vicinity of Hye Crest's proposed to allient. The Commission's rules also provide procedures for allients. The Commission's rules also provide procedures for applicable. Hye Crest will comply fully with the Commission's tules and policies in Section 21.100(d) in the event that such a minumation would even arise.

The claim of NSMA (Reply, p.11) that frequencies above the 18 and 33 GHz bands will be utilized for point-to-point systems is undoubtedly true but proves nothing. Grant of Hye Crest's proposal will not unreasonably inhibit growth of foreseeable requirements for point-to-point links for all of the reasons which we have proviously presented in this proceeding.

Contrary to the claims of NSMA (Reply, p.10), Hye Crest has ministed the "final design" of its proposed facilities and will are two completed all filings required under the Commission's ministed to demonstrate compliance with FCC equipment authorization standards. Hye Crest has now scheduled completion of the assembly of maddedich protetypes of all of its proposed transmitter facilities and malated testing. An amenament to the above captioned made to being filed concurrently herewith discusses the current captured in masse afforts and the scheduling of testing. Models of made is proposed transmit and receive antennas have already ministed issign review and testing and are being manufactured. In model numbers and antenna gain patters for the transmit model numbers and antenna gain patters for the transmit made accurrenced amendment filing.

ladding TMR comply ignores the guidance given to the Commission of National Commission MAIT Radio v. FCC, 418 F2d (1975) with respect to consideration of waiver

Tow Tipeditto R. Waddell Juwn tro 2 L 1989

> The Amenission is charged with administration in the "public informat." That an agency may discharge its responsibilities by promulgating rules of general application which, in the creatable perspective, establish the "public interest" for a world mange of situations, does not relieve it of an obligamich to seek out the "public interest" in particular individmal cases. A general rule, deemed valid because its overall shipporives are in the public interest, may not be in the "public interest" if extended to an applicant who proposes a now service that will not undermine the policy, served by the rule, that has been adjudged in the public interest. An agency need not sift pleadings and documents to identify such applications, but allegations such as those made by petitionwas, stated with clarity and accompanied by supporting data, and not subject to perfunctory treatment, but must be given a "hard look." ang talah 🐧 pada sampang pagalanggan paggalanggan panggan pan

chowing that the public interest would be served by grant of the requested waivers as provided in Section 21:19 of the Commission and that grant here will not undermine the operation of the Commission's existing rules. Waiver of Section 21:108 is fully judiciated to permit the uses and technical efficiencies of omnidirectional antennas rather than multiple point-to-point annual for the reasons covered in Hye Crest's Response filed October 13, 1988. The proviso language of Section 21:108(a) specifically contemplates authorization of point-to-multipoint activities (and may even be interpreted to obviate the need that proposed antenna facilities is not limited by the terms of Coction 21:108(b) in view of the fact that there is no established "Stand MA" or "Standard B" specification for the 27.5 - 29.5 GHz

Shapeards (Section 21.120) may not be necessary in the event measures (Section 21.120) may not be necessary in the event measures or or the commission of the numerous benefits of promoting the development of the public and innovative salve and clientings, among the other considerations addressed in Hye is a componse and its application are compelling evidence of the minimal clientest to be served by grant.

Ur. Theodore R. Waddell Januany 26, 1989 Page 4

Finally, we are also filing the attached Statement of Anthony M. Ruthowski dated January 5, 1989. This statement makes clear that HSMA has misconstrued and distorted the intended purpose and effect of the material which he drafted for Suite 12. As an expert, it is his opinion that frequency sharing between point-to-point and emmidirectional uses is ". . . clearly, easily viable in the frequency bands at issue." He also confirms his view that the rulemaking suggested by NSMA is premature.

We stand ready to supplement the foregoing showings with additional information to assist the Commission in its deliberations. We are also prepared to meet with interested parties in the event the Commission is disposed to call a meeting to discuss methods of effectuating cooperative use of the 27.5 - 28.5 GHz band in the New York SMSA. Such a meeting might be a useful way of addressing any nomaining misconceptions of the parties questioning the suitability of such cooperative use.

Very truly yours,

Heavy, V. Delula

George Y. Wheeler

Enclosure

cc (w/enc):

William B. Barfield, Esq. Thomas L. Welch, Esq. John D. Pellegrin, Esq. Dana A. Rasmussen, Esq. Mary McDermott, Esq. William C. Sullivan, Esq.

## STATEMENT OF ANTHONY M. RUTKOWSKI

The "Suite 12 Regulatory Strategy Update," attached as Exhibit B to the Esphration (Idelianal Spectrum Managers Association in a current FCC proceeding, was prepared by me in June 1987. At that time, I was a telecommunications consultant advising Suite 12 on regulatory policy routtors. Ourrently, I am an official of the International Telecommunication Union in Geneva, Switzerland, holding the position of Chief, Telecommunication Regulations and Relations Between Members Division, and Senior Counselor to the Secretary-General.

This statement is intended to clarify certain aspects of the aforementioned Sucrety Update." In particular, in paragraph 4 of that document, I stated that a "ceil scheme...makes shared use of the frequency band difficult...."

What I was referring to in that statement was the sharing of a frequency band by two omni-directional licensees, and not to the sharing by an omni-directional licensee with a point-to-point licensee. It was my opinion at that time and continues to be my opinion now, that frequency sharing between point-to-point operations and an omni-directional use is affect and wieble in the frequency bands at issue, by employing any of several techniques.

an the "Strategy Update," I suggested that Suite 12 apply for a Part 21 authorization pursuant to waiver of the Commission's Rules, and later submit a Patition for Rule Making. I understand that an affiliate of Suite 12, high North Management, has indeed filed an application for a Part 21 authorization, and that Hiye Crest believes it is premature to submit a rule marking patition. I see nothing inconsistent between my advice and the grammal Hiye Crest action or position.

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LAW OFFICES

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Federal Communications Commission
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"KOBURT"

January 26, 1989

Ms. Donna Searcy Secretary Federal Communications Commission 1919 M Street, N.W. Washington, D.C. 20554

Au: Application of Hye Crest Management, Inc. File No. 10380-CF-P-83, Callsign WLT379

Dear Ma. Searcy:

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Transmitted herewith on behalf of Hye Crest Management, Inc., in duplicate, is its Amendment to the above-referenced application for Authority to Operate a new station in the Point-to-Point Microwave Radio. Service in the 27.5 - 29.5 GHz band toward various points in the State of New York, which Amendment is being filed to supplement and update previously submitted information.

In the event there are any questions concerning this matter, please communicate with this office.

Very truly yours,

George, W. Wheeler

anoi asurt

se (m/ame):

William B. Barfield, Esq. Thomas L. Welch, Esq. John D. Pellegrin, Esq. Dana A. Rasmussen, Esq. Mary McDermott, Esq. William C. Sullivan, Esq.

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### FEDERAL COMMUNICATIONS COMMISSION

Washington, D.C. 20554

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JAN 26 1989

In Re Application of

HYE CREST MANAGEMENT, INC.

License for New Station in the Point-to-Point Microwave Radio Service in 27.5 - 29.5 GHs Band Toward Various Points in the State of New York Federal Communications Commission
Office of the Secretary

File No. 10380-CF-P-88

### AMENDMENT

Hye Crest Management, Inc. ("Hye Crest") hereby amends the above-captioned application to supplement the information previously submitted in support of its requested rule waivers in Exhibit J to include the following:

1. Shared Frequency Uses At 27.5 - 28.5 GHz Based Upon Reasonable Engineering Practices.

experts, Bernard B. Bossard and Dr. Joseph F. White, demonstrates that if reasonable engineering practices are employed, the 27.5 - 28.5 GHz band may be used by point-to-point links which are located within or adjacent to the service area of the point-to-multipoint facilities proposed by Hye Crest. From this report, it can be seen that the circumstances where unavoidable harmful interference resulting from such co-channel uses of the 27.5 - 28.5 GHz band can reasonably be anticipated are extremely rare and statistically insignificant.

# 2. Adequate Growth Capacity For Foreseeable Point-to-Point Uses.

Hye Crest adopts by reference its "Response" filed October 14, 1988 with respect to the public interest to be served by grant of its proposal. In that filing it is demonstrated that there is ample spectrum available to accommodate foreseeable growth of point-to-point links in the New York SMSA operating in frequency bands below, adjacent to and above the frequencies proposed by Hye Crest and that Hye Crest has made every reasonable effort to avoid blocking the growth of point-to-point links which are likely to need capacity in the foreseeable future. (Response, pp. 17-26)

# 3. Hye Crest's Commitment to Cooperate to Resolve Technical Conflicts.

Hye Crest confirms that it intends to comply with Section 21.100(d) of the Commission's rules by cooperating fully and making reasonable efforts to resolve any technical problems and conflicts which might inhibit effective and efficient use of the 27.5 - 28.5 GHz band for point-to-point links within its proposed service area without harmful interference.

## 4. Tamporary Waiver of Equipment Authorization.

Hye Crest is now in the process of assembling production prototypes of the transmitter models to be employed for its commercial operation. Testing of the first model transmitter is scheduled for late January, 1989. A second transmitter model will be tested approximately 1 - 2 months thereafter. Based upon

evaluations of the subassemblies for these models, Hye Crest expects that its transmitters will comply fully with applicable Commission technical specifications. The Commission will be kept informed if, as expected, temporary waiver of Section 21.120 of the Commission's rules is no longer required.

## 5. Antenna Model Numbers and Antenna Gain Patterns.

Attached hereto is preliminary test data regarding the antenna gain patterns for the transmit antennas proposed by Hye Crest.

Respectfully submitted,

HYB CREST MANAGEMENT, INC.

By

January 25, 1989

# TECHNICAL REPORT ON INTER-SYSTEM INTERFERENCE

Prepared by Mr. Bernard B. Bossard and Dr. J.F. White

Technical Report on Inter-System Interference prepared by Mr. Bernard B. Bossard and Dr. J.F. White for Hye Crest Management, Inc. in Response to National Spectrum Managers Association

The calculations supplied by NSMA are based on unrealistic assumptions that reflect extraordinary circumstances which are not encountered under standard industry practices. This results in conclusions which are so restrictive as to preclude the mutual use of the 27.5 to 28.5 GHz band by both point-to-point and the Hye Crest television broadcast service.

When these restrictive assumptions are removed it is shown that both services can operate within the 27.5 - 28.5 GHz band at very close distances.

The restrictive assumptions are specifically as follows:

First, NSMA assumes that point-to-point microwave systems would use an EIRP of 55 dBW. This is far too much for a point-to-point microwave communication system that would typically use 0.1 watts with a 38 dBi gain antenna for an EIRP of 28 dBW. Appendix C relates the intrinsic characteristics of the 28 GHz frequency band which limits power output to typically 0.1 watt.

Second, the NSMA calculation assumes an unnecessarily high value (75 dB) for the carrier to interference ratio (C/I). In an FM system the C/I can be as little as 10 dB (Ref. 1, pg. 318). This is because with FM modulation, the stronger desired signal (C) readily "captures" the receiver, causing the weaker interference (I) to be rejected. Furthermore, the Hye Crest design criteria results in the interfering signal being substantially below the point-to-point receiver noise level thereby eliminating the need for a C/I ratio consideration.

Third, the NSMA calculation does not take the channel bandwidth of the Hye Crest system into consideration. Thus, while Hye Crest would transmit a 20 dBW signal, this is distributed over 24 separate television channels, each occupying 40 MHz bandwidth. Taking this into account, each channel carries 5 watts or less of power. This gives, with a 6 dB gain omnidirectional antenna (in the azimuthal plane) an EIRP = +13 dBW over a 50 MHz bandwidth channel.

Fourth, NSMA assumes a "flat earth" (K = infinity), under which assumption radio waves would travel around the world without obstruction (See Appendix A for the impact on UHF television when this assumption is made.) In reality, over a smooth curved earth (K = 1) the line of sight distance for two towers each 35 meters (113 feet) high is limited to only 30 Km (18 miles) (Ref. 2, pg. 642). Taking refraction of the atmosphere into account (K = 4/3) extends this range over smooth earth to 30 miles. However, the earth is not smooth, particularly in New York City, where building, bridges, chimneys

and other obstructions will serve to reduce the range of 28 GHz signals to well below these values. In any event, it will be seen from the following calculations that signal levels drop rapidly with distance and even with the flat earth assumption mutual interference is unlikely.

Fifth, the NSMA calculation assumes that the interfering signal arrives on the main lobe of the victim receiving antenna. FCC rules (para. 94.75) require that point-to-point communications be conducted using at least a 38 dBi antenna with sidelobes 24 dB down at 5 degrees off the main pointing direction. Reasonable practice is to sight outside of 5 degrees when in close proximity to an existing system (in this case within 5 degrees of the Hye Crest transmitting antenna). In such cases the effective gain of the victim antenna to the interference will be 38 - 24 = 14 dBi.

Sixth, the NSMA does not take into account that there is a noise floor (kTB) with all communications systems. As will be seen in the following calculations, it is the noise floor that establishes a minimum detectable signal (MDS) below which further suppression of interference is not necessary.

Seventh, the NSMA does not allow for polarization diversity and overlapping frequency interleaving which can produce combined isolation from potential interference of 50 dB in FM systems.

When all of the above factors are included (where appropriate) in the interference calculations it will be seen that point-to-point and the Hye Crest point-to-multipoint system can both operate without mutual interference provided that reasonable and customary good engineering practice is employed.

The Hye Crest analysis does not include the rejection of interference utilizing different modulation methods which would provide additional isolation.

Satellite earth stations, although considered to be pointto-point transmitters, are recognized to have significant sidelobe levels up to +55 dBW (see Section 25.204(a) of the FCC Rules and Regulations), making in effect point-to-multipoint transmitters. Consequently, there is precedent for simultaneous operation of point-to-point and point-to-multipoint operation in the same band (at 6 GHz); yet, if the interference estimating methods employed for the NSMA calculations are applied to this common communication band, an intolerable separation distance (125,000,000 miles) is obtained. (See Appendix B.) Thus, the NSMA assertion that point-to-point and point-to-multipoint cannot share a common frequency band is contrary to existing radio practice. Note that orthogonal polarization and frequency interleaving are not available for isolation between terrestrial microwave and satellite uplinks at 6 GHz since both are already used in the satellite uplink.

The following calculations treat four cases of potential interference with the results summarized below:

- Case 1) Hye Crest transmitter interfering with point-to-point receiver within a cell.

  NO INTERFERENCE OCCURS WHEN THE POINT-TO-POINT NETWORKS USE TRANSMIT/RECEIVE SITES WHICH ARE PLACED AT LEAST 660 FEET (1/8) MILE FROM AND ORIENTED AT AN ANGLE OF AT LEAST 5 DEGREES AWAY FROM THE DIRECTION TO THE HYE CREST OMNI ANTENNA.
- Case 2) Hye Crest transmitter interfering with point-to-point receiver beyond a cell.

  NO INTERFERENCE IS EXPERIENCED REGARDLESS OF POINTING DIRECTION.
- Case 3) Point-to-point transmitter interfering with Hye Crest receiver within a cell.

  A POINT-TO-POINT SYSTEM WILL NOT INTERFERE WITH THE HYE CREST SERVICE UNDER THE SAME RESPECTIVE ASSUMPTIONS USED FOR CASES 1) AND 2) AND THE ADDITIONAL CONDITION THAT IT IS AT LEAST 5 DEGREES OFF AXIS AND NOT CLOSER THAN 1000 FEET TO A HYE CREST SUBSCRIBER RECEIVER, OR, WITH 10 DEGREES OFF AXIS SIGHTING, NOT CLOSER THAN 581 FT.
- Case 4) Point-to-point transmitter interfering with Hye Crest receiver beyond a cell.

  THE POINT-TO-POINT CAUSES NO INTERFERENCE REGARDLESS OF SIGHTING DIRECTION.

Even these modest restriction to avoid interference can be further relaxed if point-to-point system uses a different modulation than that of the Hye Crest system. To be conservative in three calculations, both systems were assumed to have the same FM signal modulation format.

### **ASSUMPTIONS**

The following assumptions are made in the interference calculations made for Cases 1), 2), 3) and 4) which follow.

- a) The potential interfering signal (I) is not disruptive to the point-to-point carrier (C) when the level of I is 3 dB or more below the noise threshold for the receiver which receives C. (Ref. 1, pg. 318)
- b) A worst case scenario is assumed whereby the point-topoint system uses the same FM signal format as the Hye Crest system. (For different modulations, additional isolation will be obtained due to the receiver selectivity to different modulations.)

- c) The point-to-point and Hye Crest systems use orthogonal polarizations, thereby deriving at least 25 dB of isolation. (Ref. 1, pg. 502)
- d) The point-to-point system uses a frequency interleaved channel plan with respect to Hye Crest, as is employed by satellites operating in the 3.7-4.2 GHz band, thereby deriving an additional 25 dB of isolation. (Ref. 4, pg. 266)
- e) The point-to-point system uses antennas which meet the FCC regulations for gain and sidelobes for the 27.5-29.5 GHz band, including 38 dB minimum gain, -24 dB minimum sidelobe isolation at 5 degrees off boresight, -29 dB at 10 degrees.

#### CALCULATIONS

Case 1) WITHIN THE 4 TO 5 MILE RADIUS OF A HYE CREST OMNI TRANSMITTER, TRANSMISSIONS FROM THE HYE CREST CENTRAL MODE TRANSMITTER WILL NOT INTERFERE WITH POINT-TO-POINT COMMUNICATION NETWORKS WHEN THOSE NETWORKS USE TRANSMIT/RECEIVE SITES WHICH ARE PLACED AT LEAST 660 FEET (1/8 MILES) FROM AND ORIENTED AT AN ANGLE OF AT LEAST 5 DEGREES AWAY FROM THE DIRECTION TO THE HYE CREST OMNI ANTENNA. THE PROBABILITY THAT A POINT-TO-POINT RECEIVER WILL BE WITHIN 660 FEET OF A HYE CREST TRANSMITTER IS ONLY 0.0016%.

In this calculation the point-to-point system with transmitter/receiver sites at A and B is operated within 660 feet (1/8 mile) of the Hye Crest omni transmitter C and on an azimuthal heading which is at least 5 degrees off of the heading from A to C. (See Figure 1).

The Hye Crest system radiates a maximum of 5 watts per 40 MHz channel using an antenna which has a uniform azimuthal pattern and an overall gain of 6 dBi, for resulting EIRP (effective isotropic radiated power) of 13 dBW.

The path loss of the signal from C to A is given by (Ref. 1, pg. 250)

FSL (db) = 36.58 + 20log(F) + 20log(d) Equation 1.

where

FSL (db) is the free space attenuation in decibels F is the carrier frequency in megahertz d is the distance in statute miles

For a carrier at 28 GHz and a distance of 1/8 mile, FSL (dB) = 36.58 + 20log(28,000) + 20log(1/8) Equation 2. = 36.58 + 88.94 - 18.06 = 108 dB

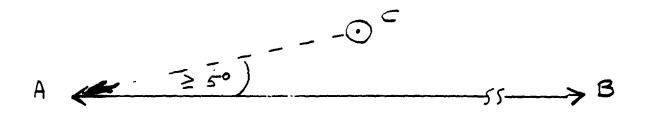


FIGURE 1

A: PPM-RC B: PPM-TX C: HC-TX Assume a point-to-point antenna at A with 38 dBi gain, a sidelobe which is 24 dB below at 5 degrees off boresight, per FCC regulations, and a polarization isolation of -25 db; then the gain in the direction of C is

Gain (AC) = 38 dbi - 24 db - 25 db = -11 dBi

Assume an interleaved frequency plan between the point-to-point system and the Hye Crest system; for example, if the Hye Crest channel is at 28000 MHz then the point-to-point frequencies are 27980 and 28020 MHz. This yields an FM selectivity (S) separation of

S = 25 dB

Then the maximum interfering signal from C to A is given by

I(CA) = EIRP(C) - FSL(CA) + G(AC) - S Equation 3. = 13 dBW -108 dB + (-11 dBi) - 25 dB = -131 dBW Equation 4.

On the other hand, the minimum threshold FM signal (MTS) at A is given by (See Ref. 1, pg. 74, Eq. 2.34)

MTS = -204 dBW + 10log(BW) + NF + 10 Equation 5.

where

MDS is the noise floor (in dBW at 290 deg/K or

17 deg/C)

BW is the receiver IF bandwidth in Hz

NF is the noise figure of the receiver in dB

10 dB is the minimum FM signal above noise to

The noise figure of a commercial receiver available in the 23 GHz band, such as the M/A-COM Inc. Model 23-VFM, is about 12 dB. Commercial receivers (other than those produced by Hye Crest) are not currently available at 28 GHz, but their noise figure, when available, can be expected to be no better than that at 23 GHz.

permit FM enhancement

Accordingly, the MTS at A is given by

MTS(A) = -204 dBW+10log(40,000,000 Hz)+12dB+10dB Equation 6. = -204 dBW + 76 dB + 12 dB + 10 dB = -106 dBW<sup>1</sup>

Since the MTS(A) is -106 dBW (the noise floor is at -116 dBW) and the interference is at -131 dBW, the signal from the Hye Crest omni transmitter is well below the noise level at A and would not interfere with the communication of the point-to-point system from A to B.

Receiver threshold for M/A-COM MA-23VFM receiver at 23 GHz is -72 dBm (- 102 dBW)

Consequently, the point-to-point receiver may be located as close at 660 feet (1/8) to a Hye Crest transmitter without receiving interference. Yet the probability of this occurring is only 0.0016%. This is calculated as follows: the probability is the ratio of the volume of a hemisphere of 1/8 mile radius to the volume of a hemisphere of 5 mile radius. This ratio is equal to the ratio of the cubes of the radii:  $(1/8)^3/(5)^3 = 0.0000156 = 0.0016$ %.

Case 2) THE POINT-TO-POINT TRANSMITTER AND RECEIVER ARE BOTH OUTSIDE OF THE 4 TO 5 MILE RADIUS SERVICE AREA OF THE HYE CREST OMNIDIRECTIONAL TRANSMITTER (SEE FIG. 2) IN THIS CASE NO INTERFERENCE IS EXPERIENCED BY THE POINT-TO-POINT SYSTEM REGARDLESS OF ITS POINTING DIRECTION.

A worst case scenario is assumed in which the point-to-point transmitter/receivers (A and B) are on a direct heading the Hye Crest omnidirectional transmitter (C). It is further assumed that there is a negligible distance between A and B. Then A is 5 miles from C and on a direct heading with C.

The interference I at A is found by reapplying Equation 1 and 3 to this case. First, the free space loss, FSL, for the 5 mile range at 28 GHz, is

Applying this FSL and a victim antenna gain G(CA) = 13 dB (corresponding to an antenna gain of 38 dB - 25 dB for cross polarization isolation) at A to the remaining conditions used for Equation 4 gives

$$I(CA) = 13 \text{ dBW } -139.5 \text{ dB} + 13 \text{ dB} -25 \text{ dB}$$
 Equation 8.  
= -138.5 dBW

Again it is seen that this signal is well below the noise floor of -116 dBW at A and therefore causes no interference with the point-to-point system.

Case 3) A POINT-TO-POINT SYSTEM WILL NOT INTERFERE WITH THE HYE CREST SERVICE UNDER THE RESPECTIVE ASSUMPTIONS USED FOR CASES 1 AND 2 AND THE ADDITIONAL CONDITION THAT IT IS NOT CLOSER THAN 1000 FEET FROM A HYE CREST SUBSCRIBER RECEIVER AT 5 DEGREES OFF AXIS, OR 581 FEET AT 10 DEGREES OFF AXIS SIGHTING.

Here it is assumed that a point-to-point system operates within the 4 to 5 mile radius Hye Crest service area in the same band and with the same FM signal format. It employs frequency interleaving, cross polarization, and a 38 dBi antenna meeting FCC sidelobe regulations, including 24 dB sidelobe isolation at 5 degrees off axis and 29 dB at 10 degrees. (See Figure 3.)

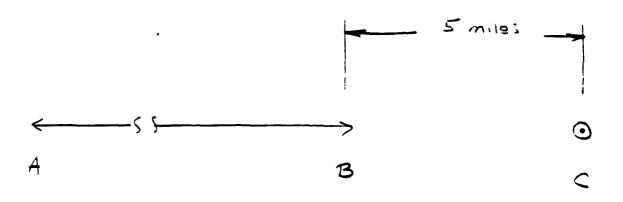


FIGURE 2

In order for the point-to-point system (transmitter/receivers A and B in Figure 3) not to interfere with the Hye Crest desired signal, the interference signal I(D) must be at least 3 dB below the -116 dBW noise floor. For this calculation, then, the interfering signal arriving at the Hye Crest subscriber from the point-to-point transmitter at A is not to exceed -119 dBW.

This power level will be used to estimate the minimum range (d) to be allowed between the point-to-point transmitter A and the Hye Crest subscriber D (shown in Figure 3) from the following relationship.

I(D) = EIRP(A) -FSL + G(DA) - S Equation 9. where

EIRP(A) is effective isotropic radiated power of the interfering transmitter

FSL is the free space loss

G(DA) is the gain of the victim receiving antenna in the direction of the interfering transmitter

S is the selectivity of the victim receiver to the desired relative to the interfering signal

In this calculation a point-to-point transmitter of 0.1 watts is assumed to be used with a 38 dBi antenna for an EIRP(I) of 28 dBW. The victim receiver also uses a 38 dBi gain antenna with 24 dB maximum sidelobe (per FCC regulations) at 5 degrees off boresight heading. it also has 25 dB cross polarization rejection. The resulting G(DA) is therefore 38-24-25=-11 dBi. Finally, interleaved 40 MHz signal bandwidths are assumed, yielding a selectivity S=25 dB. Substituting the above values into Equation 9 gives

-119 dBW = 28 dBW - FSL + (-11 dB) - 25 dB Equation 10.

and solving for FSL gives

Substituting this value into Equation 1 to solve for the distance gives the minimum separation for a 5 degree off axis sighting,

Alternatively, if the point-to-point system is sighted 10 degrees off of the Hye Crest omni heading, then the sidelobe isolation of the antenna at D will be increase from 24 to 29 dB. The resulting separation d can be reduced to .11 miles (581 feet).

From this result it follows that the point-to-point transmitter can be located within the 5 mile service radius of the Hye Crest system and will not cause interference with any of